DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1.

Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Whitefield (US pat 6512985) in view of Bone (US pat 6647309) and Kulkarni (US pat 5991699).

With respect to claim 1, Whitefield discloses a method comprising:

1) Receiving at least one process parameter from a sensor that monitors a process parameter of the manufacturing process while the plurality of physical objects is being manufactured (column 1, lines 27-30).

2) Automatically performing an analysis using values of the at least one process (column 1, lines 27-30).

3) Determining, based on the analysis, that at least one physical object of the plurality of physical objects does not satisfy a prescribed selection criterion (column 1, lines 45-49).

4) Marking the at least one physical object in such a way that the at least one marked physical object must be sent for a special measurement (column 1, lines 62-64).

With respect to claim 2, Whitefield discloses that the physical object is a wafer (column 1, line 21).

With respect to claim 3, Whitefield discloses that the analysis is a statistical analysis (column 1, lines 39-40).

With respect to claim 4, Whitefield discloses that the values of the at least one process parameter are measured when the plurality &physical objects is being manufactured (column 1, lines 11-13).

With respect to claim 5, Whitefield discloses sending the at least one marked physical object for a special measurement (column 1, lines 64-66).

With respect to claim 6, Whitefield discloses that the special measurement is a measurement for checking the quality of the at least one marked physical object (column 1, lines 64-66).

With respect to claim 7, Whitefield discloses continuing the manufacturing process for any of the plurality of physical objects not marked as failing the prescribed selection criterion (see Ref. 22).

With respect to claim 8, Whitefield discloses that the selection criterion is a quality characteristic of the manufacturing process (column 1, lines 16-20).

With respect to claim 9, Whitefield discloses that the selection criterion is not satisfied if a value & the at least one process parameter goes above or below a prescribed limit value (column 1, lines 50-55).

With respect to claim 10, Whitefield discloses an apparatus comprising:

1) a processor, the processor configured to cause the device to:

2) Receive at least one process parameter from a sensor that monitors a process parameter of a manufacturing process while the plurality of physical objects are being, manufactured (column 1 lines 27-30).

3) Perform an analysis using values of the at least one process parameter (column 1, lines 27-30).

4) Mark at least one physical object when, as a result of the analysis, the at least one physical object does not satisfy a prescribed selection criterion (column 1, lines 62- 64).

6) Send the at least one marked physical object for special treatments (column 1, lines 64-66).

With respect to claims 11-12, Whitefield discloses a method comprising:

1) Receiving at least one process parameter from a sensor that monitors a process parameter of the manufacturing process while the plurality of physical objects is being manufactured (column 1, lines 27-30).

2) Performing an analysis using values of the at least one process (column 1, lines 27-30).

3) Marking the at least one physical object in such a way that the at least one marked physical object must be sent for a special measurement (column 1, lines 62-64).

5) Sending the at least one marked physical object for special treatments (column 1, lines 64-66).

With respect to claim 1, Whitefield fails to disclose:

1) A sub-production installation of the manufacturing process measured while the plurality of physical objects is being manufactured..

2) Performing the process automatically.

5) Preventing values associated with the at least one marked physical object from affecting, a product quality measurement of the plurality of physical objects.

It would have been obvious to one skilled in the art at the time of the invention to automate the method. Merely using a computer to automate a known process does not by itself impart nonobviousness to the invention (limitation 2) above). See In re Venner, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958). See also Dann v. Johnston, 425 U.S. 219, 227-30, 189 USPQ 257, 261 (1976). See IV [PEP 2106. Despite this, the examiner presents the following teaching reference.

With respect to claim 10, Whitefield fails to disclose:

2) A sub-production installation of the manufacturing process measured while the plurality of physical objects is being manufactured..

5) preventing values associated with the at least one marked physical object from affecting, a product quality measurement of the plurality of physical objects.

With respect to claims 11-12, Whitefield fails to disclose:

1) A sub-production installation of the manufacturing process measured while the plurality of physical objects is being manufactured.

4) Preventing values associated with the at least one marked physical object from affecting, a product quality measurement of the plurality of physical objects.

Bone teaches, with respect to claims 1 and 11-12:

1) Measuring "process parameter values" (column 6 lines 10- 43; including stray gasses, environmental data etc) of a sub-production installation of the manufacturing process while the

plurality of physical objects is being manufactured (column 6 lines 10-43) by an automated system (Fig 3).

Bone teaches, with respect to claim 10:

2) Measuring "process parameter values" (column 6 lines 10- 43; including stray gasses, environmental data etc) of a sub-production installation of the manufacturing process while the plurality of physical objects is being manufactured (column 6 lines 10-43) by an automated system (Fig 3).

It would have been obvious to one of ordinary skill in the art to modify the method and apparatus of Whitefield by additionally monitoring the parameters of the machinery itself and to perform automated, "during production" monitoring. As previously stated, automated manufacture and monitoring are obvious and well known in the prior art for reasons of cost, sterility, and reliability. Further, one of ordinary skill in the art would understand to also take interest in the behavior of the manufacturing equipment itself and understand that it has an effect on the finished product (Bone column 1 lines 23-57).

In combination, the wafers AND the manufacturing equipment parameters may be monitored and wafers may be marked for rework, additional measurements, and/or disposal based upon a fault in either set of conditions.

Kulkarni teaches, with respect to claims 1 and 10:

5) Preventing values associated with the at least one marked physical object from affecting, a product quality measurement of the plurality of physical objects (Figs 10a-e item 128 and column 9 line 65 - column 10 line 7 and column 10 lines 12-33).

Kulkarni teaches, with respect to claims 11-12:

4) Preventing values associated with the at least one marked physical object from affecting, a product quality measurement of the plurality of physical objects (Figs 10a-e item 128 and column 9 line 65 - column 10 line 7 and column 10 lines 12-33).

It would have been obvious to one of ordinary skill in the art to modify the method of Whitefield by excluding data from "bad" components or regions as taught by Kulkarni. As stated by Kulkarni (column 10 lines 1-7), this is a way to effectively determine the cause of systematic and recurring failures in wafer fabrication. One of ordinary skill in the art would find it obvious to apply the known method of determining mis-fabrication cause of Kulkarni to the similar manufacturing methods of Whitefield in order to achieve the same described benefits.

2.

Claims 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Whitefield in view of Bone (US pat 6647309) and Kulkarni (US pat 5991699).

With respect to claim 13, Whitefield discloses performing an analysis using values of at least one process parameter of a manufacturing process of a plurality of physical objects (column 1, lines 27-30); determining that at least one physical object of the plurality of physical objects does not satisfy a prescribed selection criterion (column 1, lines 45-49); marking the at least one physical object in such a way that the at least one marked physical object must be sent for a special measurement (column 1, lines 62-64); and removing the at least one marked physical object from the manufacturing process (column 1, lines 64-66).

With respect to claim 14, Whitefield discloses performing an analysis using values of at least one process parameter of the manufacturing process of the plurality of physical objects (column 1, lines 27-30); marking at least one physical object when as a result of the analysis, the

at least one physical object does not satisfy a prescribed selection criterion (column 1, lines 62-64); removing the at least one marked physical object form the manufacturing process (column 1, lines 64-66); and sending the at least one marked physical object for special treatments (column 1, lines 64-66).

With respect to claim 15, Whitefield discloses performing an analysis using values of at least one process parameter of the manufacturing process of the plurality of physical objects (column 1, lines 27-30); marking at least one physical object when, as a result of the analysis, the at least one physical object does not satisfy a prescribed selection criterion (column 1, lines 62-64); removing the at least one marked physical object form the manufacturing process (column 1, lines 64-66); and sending the at least one marked physical object for special treatments (column 1, lines 64-66).

With respect to claim 16, Whitefield discloses performing an analysis using values of at least one process parameter of the manufacturing process of the plurality of physical objects (column 1, lines 27-30); marking at least one physical object when, as a result of the analysis, the at least one physical object does not satisfy a prescribed selection criterion (column 1, lines 62-64); removing the at least one marked physical object form the manufacturing process (column 1, lines 64-66); and sending the at least one marked physical object for special treatments (column 1, lines 64-66).

With respect to claims 13-16, Whitefield fails to disclose preventing values associated with the at least one marked physical object from affecting an average product quality of the plurality of physical objects.

Kulkarni teaches, with respect to claims 13-16:

Preventing values associated with the at least one marked physical object from affecting, a product quality measurement of the plurality of physical objects (Figs 10a-e item 128 and column 9 line 65 - column 10 line 7 and column 10 lines 12-33).

It would have been obvious to one of ordinary skill in the art to modify the method of Whitefield by excluding data from "bad" components or regions as taught by Kulkarni. As stated by Kulkarni (column 10 lines 1-7), this is a way to effectively determine the cause of systematic and recurring failures in wafer fabrication. One of ordinary skill in the art would find it obvious to apply the known method of determining mis-fabrication cause of Kulkarni to the similar manufacturing methods of Whitefield in order to achieve the same described benefits..

Bone teaches, with respect to claims 13-16, measuring "process parameter values" (column 6 lines 10- 43; including stray gasses, environmental data etc) while the plurality of physical objects is being manufactured (column 6 lines 10-43) by an automated system (Fig 3).

It would have been obvious to one of ordinary skill in the art to modify the method and apparatus of Whitefield by additionally monitoring the parameters of the machinery itself and to perform automated, "during production" monitoring. As previously stated, automated manufacture and monitoring are obvious and well known in the prior art for reasons of cost, sterility, and reliability. Further, one of ordinary skill in the art would understand to also take interest in the behavior of the manufacturing equipment itself and understand that it has an effect on the finished product (Bone column 1 lines 23-57).

In combination, the wafers AND the manufacturing equipment parameters may be monitored and wafers may be marked for rework, additional measurements, and/or disposal based upon a fault in either set of conditions.

Response to Arguments

Applicant's arguments filed 8/28/2008 have been fully considered but they are not persuasive.

On page 8 of the response, applicant argues that prior art Kulkarni fails to disclose "preventing values associated with the at least one marked physical object from affecting a product quality measurement." Applicant points out that the claim refers to "quality data" and that Kulkarni instead refers to "defect properties". The examiner respectfully disagrees. First, the examiner believes that applicant is reading undue limitations into the term "product quality measurement". One of ordinary skill in the art would understand the reasonable broadness of this term to include such concepts as a pass/fail determination, a statistical representation of pass/fail of wafers, rate of individual inspection/test pass/fail results for each or many wafers, results from inspections etc. All of these are "product quality measurements". Further, the phrase "values associated with" gives even further breadth to the limitation. In keeping with the previously cited examples, any inspection/test data, sampling data, sampling control data, and test parameters are "associated with" the quality of the product. Specific to the prior art in question, Kulkarni removes wafer data pertaining to known failure methods from further consideration. In this case, the pool of wafers being considered (or reported) can be fairly considered to be "a product quality measurement" and all wafer/test data are "associated with" it. By removing sets of data/wafers from further consideration, they are removed from the "product quality measurement".

In related discussion, applicant argues on pages 9 and 10 that combination of references would not have been obvious to one of ordinary skill in the art and further questions how such a combination would manifest.

Whitefield describes a wafer testing system and apparatus which can determine whether or not a processed wafer passes various tests and ultimately classify the wafer, overall, as an acceptable wafer or not. In doing this, Whitefield discloses that some wafers will pass a set of tests but fail another and often must be re-evaluated. Kulkarni teaches that often certain patterns may be recognized as failures of a known source and that wafers expressing these patterns should be removed from further consideration of failure types in an attempt to determine proper corrective actions. In combination, wafers which pass one battery of tests but fail another may be classifiable as suffering from a known mechanism which may be either acceptable or unacceptable in its own right. These wafers (and thus their pertinent data) are then removed from consideration (for both corrective action determination AND further failure classification) as they are already determined to have passed or failed. Bone also teaches wafer production and notes that tool process parameters should be considered in wafer testing. In combination, the system would consider the parameters of the tools used to produce wafers as test data in its own right. This means that a wafer produced in a tool expressing certain behaviors (such as irregular or out-of–tolerance behavior) could be failed based upon that in order to save time of further wafer testing.

The motivations for such modification of base reference Whitefield are both presented by the prior art themselves and further obvious to one of ordinary skill in the art. With respect to Kulkarni, the motivation is to increase defect detection reliability (column 2 lines 7-17) which

will ultimately reduce cost (column 4 lines 1-10). With respect to Bone, the motivation is increased process control and the ability to detect bad wafers more efficiently (column 7 lines 1-35) and to avoid mis-processing of wafers due to environmental variables (column 2 lines 11-32).

Further, each of Whitefield, Bone and Kulkarni are directed to semiconductor wafer manufacturing, process control, and inspection. One of ordinary skill in the art, in reviewing similar art, would have been motivated to consider them together in order to establish a wafer inspection and evaluation method and apparatus which is as inclusive and comprehensive as possible, accounting for and able to correct as many potential problems as possible in order to produce wafers which are reliable and inexpensive.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JONATHAN TEIXEIRA MOFFAT whose telephone number is (571)272-2255. The examiner can normally be reached on Mon-Fri, from 7:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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10/16/2008

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